

Message

From: Fennessy, Christopher [christopher.fennessy@Rocket.com]
Sent: 3/22/2021 6:56:57 PM
To: Swanson, Charles [Swanson.Charles@epa.gov]; MacDonald, Alex@Waterboards (Alex.MacDonald@waterboards.ca.gov) [Alex.MacDonald@waterboards.ca.gov]; jim.rohrer@dtsc.ca.gov
CC: Wallace, Stan [swallace@eaest.com]; Beauchemin, Melissa [mbeauchemin@eaest.com]; Black, Ned [Black.Ned@epa.gov]; Brad Sample [bsample@ecorisk.com]; Weisberg, Mark [Mark.Weisberg@aptim.com]; Kraemer, Sue (Sue.Kraemer@aptim.com) [Sue.Kraemer@aptim.com]
Subject: RE: [EXTERNAL] RE: Aerojet Rocketdyne - BERA SAP - Wet Weather Sampling Discussion
Attachments: Final BERA Wet Weather SAP.pdf

Hi Everyone – Attached is the Final BERA Wet Weather SAP. We will keep you updated on schedule as soon as we obtain feedback from the sediment survey, which has been ongoing for the past week.

Chris

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From: Swanson, Charles <Swanson.Charles@epa.gov>
Sent: Wednesday, March 17, 2021 5:11 PM
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Subject: RE: [EXTERNAL] RE: Aerojet Rocketdyne - BERA SAP - Wet Weather Sampling Discussion

Chris,

EPA is comfortable with the responses detailed below. Please send along the latest version of the SAP when you have it prepared.

Thanks,

Chuck

From: Fennessy, Christopher <christopher.fennessy@Rocket.com>
Sent: Wednesday, March 17, 2021 11:43 AM
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Cc: Wallace, Stan <swallace@eaest.com>; Beauchemin, Melissa <mbeauchemin@eaest.com>; Black, Ned <Black.Ned@epa.gov>; Brad Sample <bsample@ecorisk.com>; Weisberg, Mark <Mark.Weisberg@aptim.com>; Kraemer, Sue (Sue.Kraemer@aptim.com) <Sue.Kraemer@aptim.com>
Subject: RE: [EXTERNAL] RE: Aerojet Rocketdyne - BERA SAP - Wet Weather Sampling Discussion

Hi Chuck – Please see below for responses to these additional comments. Chris

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Subject: RE: [EXTERNAL] RE: Aerojet Rocketdyne - BERA SAP - Wet Weather Sampling Discussion

Chris,

These are some additional comments/responses from EPA.

- EPA would like Aerojet to provide at least a brief argument, with literature references, on the relative Ah receptor sensitivity in invertebrates versus vertebrates and why this justifies their SAP for dioxins. Aerojet is correct in that invertebrates are less impacted by the additive toxic effects of dioxins/furans and therefore the sediment screening benchmark for dioxins/furans (protective of benthic invertebrates) is solely based on 2,3,7,8-TCDD. Invertebrates lack the AhR receptor which is the source of the toxic response in vertebrates. However, if Aerojet is planning to evaluate the aquatic community (i.e., fish and amphibian endpoint) they would also need the full suite of congeners to calculate a TEQ-Fish.

The aryl hydrocarbon (Ah) receptor plays an important role in a growing list of developmental and physiological processes in conjunction with structurally diverse ligands, including both synthetic compounds and natural products. Ah receptors are best known as a nuclear receptor that mediates the toxic effects of environmental contaminants, including dioxin-like chlorinated hydrocarbons and polynuclear aromatic hydrocarbons. The prototypical xenobiotic agonist is 2,3,7,8 TCDD, which binds to the Ah receptor with high affinity. Following ligand binding, the Ah receptor translocates from the cytoplasm to the nucleus, shedding a complex of cytoplasmic chaperones, and binding a protein coding gene (Shoots et al., 2015).

As discussed in Van den Berg et al., 1998, the relative Ah receptor binding sensitivity for 2378-TCDD is much lower in fish compared with mammals. Invertebrates and amphibians are not discussed in this publication, and TEFs for these receptors are not presented. In EPA (2001), in the Workshop Case Studies, it is stated that “Other aquatic life (aquatic plants, invertebrates, and amphibians) are much more tolerant of TCDD than fish,

mammals, and birds and thus would not be receptors of concern” and “Invertebrate and plant populations were determined not to be of concern because of their demonstrated tolerance to TCDD in laboratory studies.” Shoots et al. (2015), Collier et al. (2008), and Jung and Walker (1997) present some 2378-TCDD toxicity data for amphibians, and generally conclude that these receptors are not overly sensitive to this COPEC. They also do not mention the use of any 2378-TCDD TEFs for other dioxin/furan congeners.

Invertebrates are less impacted by the additive toxic effects of dioxins/furans and the sediment screening benchmark for dioxins/furans (as cited by EPA Region 3) is $8.5\text{E-}4$ ug/kg for 2,3,7,8-TCDD (EPA, 2009), cited therein as from Van den Berg et al. (1998). However, per Van Reed (2014), this is a misprint, and this sediment benchmark is actually from CCME (2003), presented as an Interim Sediment Quality Guideline, and stated as applicable for sediment screening conservatively using fish toxicity equivalency factors (TEFs) from Van den Berg et al (1998). The specific sediment receptors that establish the basis of this benchmark are not stated in the Summary Table. A sediment probable effect level (PEL) of $2.15\text{E-}3$ ug/kg is also presented in CCME (2003). As invertebrates lack the Ah receptor which is the source of the toxic response in vertebrates, it is overly conservative to use fish TEFs for sediment invertebrates.

- Aerojet has concluded that Eco-M¹ is a COPEC in sediments; however, they claim that since they are evaluating this in soil, they don't need to keep Eco-M in as a COPEC in sediment. This is questionable as locations termed “sediment” are likely to be soil in the future and evaluated as such in the risk assessment. In this case, they should keep Eco-M as a COPEC in sediment, which means they will need to run the full suite of congeners for dioxins/furans. The analytical cost to run dioxins/furans is high so having the full list reported should not cost any more. This will allow a larger dataset when evaluating potential risks in soil, assuming that the sediments will also be evaluated as soil.

Agreed. The full suite of 17 dioxins/furans congeners will be added to the proposed sediment sample locations, as these locations could dry out over the warmer months of the year and essentially function as soil. As soil, the Eco-Mammal and Eco-Avian TEQs would be important for the assessment of terrestrial wildlife receptors.

¹[Footnote: Ecological risk to fish, mammals, and birds from dioxins/furans is calculated based on the relative toxicity to 2,3,7,8-TCDD, the most toxic congener. Each of the 17 congeners is assigned a toxicity equivalency factor (TEF), with 2,3,7,8 TCDD receiving a 1 and everything else a fraction of 1. Concentrations of each congener are multiplied by their respective TEF and summed to develop a total equivalency (TEQ). This is generally termed TEQ-Mammal, TEQ-Bird, TEQ-Fish, depending on the receptor. I assume their Eco-M is equivalent to TEQ-mammal.] Correct.

References Cited Above:

Canadian Council of Ministers of the Environment (CCME), 2003, Summary of Existing Canadian Environmental Quality Guidelines, Freshwater Interim Sediment Quality Guidelines and Probable Effect Levels, Summary Table, December.

Collier, A., L. Orr, J. Morris, and J. Blank, 2008, *The Effects of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) on the Mortality and Growth of Two Amphibian Species (Xenopus laevis and Pseudacris triseriata)*, **International Journal of Environmental Research and Public Health**, 5(5): 368-377.

EPA, 2009, EPA Region 3 Freshwater Sediment Screening Benchmarks, November 10.

EPA, 2001, *Workshop Report on the Application of 2,3,7,8-TCDD Toxicity Equivalence Factors to Fish and Wildlife*, EPA/630/R-01/002 August.
www.epa.gov/ncea/raf

Jung, R.E. and M.K. Walker, 1997, *Effects of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) on Development of Anuran Amphibians*, **Environmental Toxicology and Chemistry**, 16(2): 230-240.

Shoots, J., D. Fracalvieri, D.G. Franks, M. S. Denison, M. E. Hahn, L. Bonati, and W. H. Powell, 2015, *An Aryl Hydrocarbon Receptor from the Salamander (Ambystoma mexicanum) Exhibits Low Sensitivity to 2,3,7,8-Tetrachlorodibenzo-p-dioxin*, **Environ Sci Technol**. June 2; 49(11): 6993–7001.

Van den Berg, M., et al., 1998, *Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, and PDCFs for Humans and Wildlife*, **Env Health Perspectives**, December; 106 (12): 775-792.

Van Reed, 2014, Personal communication between Paul Van Reed, EPA Region 3 BTAG Contact for Freshwater Sediment Screening Website and Mark Weisberg, CB&I (now APTIM) Risk Assessor. November 3.

Thanks,

Chuck

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Kraemer, Sue (Sue.Kraemer@aptim.com) <Sue.Kraemer@aptim.com>
Subject: RE: [EXTERNAL] RE: Aerojet Rocketdyne - BERA SAP - Wet Weather Sampling Discussion

Thanks Chuck! Below are responses to EPA's recent comments. Attached is the updated Wet Weather SAP (both in RLSO and .pdf). Note, tables in .pdf are in RLSO for clarity. Recall, AR will incorporate this information into the Final BERA SAP once all comments/responses are resolved. We have begun ecological surveys and hope to have some rain this week to further evaluate sediment habitat.

- Will Aerojet do the bioavailability sampling (BLM parameters in surface water and AVS/SEM in sediment) in the first tier of sampling? Neither the text nor Table 3-1 reflects this. This line of evidence (bioavailability) may help indicate whether an additional round of sampling for toxicity and chemistry is necessary. Yes. Text and Table 3-1 has been revised.
- Which figure(s) show the PFAS samples? Please revise figure titles to reflect where PFAS will be analyzed. All SW locations will be analyzed for PFAS (Fig. 2-11). Only six of the Site SED samples in Fig. 2-8 are planned for PFAS analysis (6 will be selected, and listed in a figure note). Three background reference sediment samples will be analyzed for PFAS, also listed on the figure as a note). Fig 2-8 title has been changed to "Proposed Sample Locations Sediment - Metals and PFAS, BERA SAP." PFAS has been spelled out in the revised figure.
- Tables and text indicate that sediment samples will be analyzed for the full suite of dioxins/furans. Please confirm this is true and revise the title of Figure 9. Figure 2-9 is correct; only 2,3,7,8-TCDD sediment concentrations exceeded the sediment toxicity screening level. There are no 2378-TCDD TEQs for sediment related to aquatic benthic invertebrate exposure. All associated tables and text have been revised to clarify that only 2378-TCDD will be analyzed for the sediment samples. If EPA wants more information on why we are not

looking beyond 2,3,7,8-TCDD, we can expand about the lack of sensitivity of the Ah receptor (which is the basis for TEFs) in invertebrates as compared to vertebrates.

- References to Figure 2-10 should be deleted throughout the text. Agreed (except where one reference to this figure is needed, prior to dropping barium in surface water).
- Table 3-1 is a bit challenging to follow. There is no indication in this table that they will be sampling for dioxin/furans from the reference areas. Might be easier to just provide a new table rather than showing all of the text strikeouts and edits? 2378-TCDD was inadvertently left off the Reference Areas Sediment sampling "Chemical Groups for Analysis." It has been added. As the strikeout edits will be removed once the complete SAP is generated (e.g., addressing soil, soil vapor, sediment, and surface water), it is recommended the current format should be retained. Table 3-1 has been increased in size to 11x17 for readability.

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Subject: [EXTERNAL] RE: Aerojet Rocketdyne - BERA SAP - Wet Weather Sampling Discussion

Chris,

Below are EPA's comments on the current version of the Wet Weather SAP.

- Will Aerojet do the bioavailability sampling (BLM parameters in surface water and AVS/SEM in sediment) in the first tier of sampling? Neither the text nor Table 3-1 reflects this. This line of evidence (bioavailability) may help indicate whether an additional round of sampling for toxicity and chemistry is necessary.
- Which figure(s) show the PFAS samples? Please revise figure titles to reflect where PFAS will be analyzed.
- Tables and text indicate that sediment samples will be analyzed for the full suite of dioxins/furans. Please confirm this is true and revise the title of Figure 9.
- References to Figure 2-10 should be deleted throughout the text.

- Table 3-1 is a bit challenging to follow. There is no indication in this table that they will be sampling for dioxin/furans from the reference areas. Might be easier to just provide a new table rather than showing all of the text strikeouts and edits?

Thanks,

Chuck

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Kraemer, Sue (Sue.Kraemer@aptim.com) <Sue.Kraemer@aptim.com>
Subject: RE: Aerojet Rocketdyne - BERA SAP - Wet Weather Sampling Discussion

Hi Everyone – Attached are the updated responses to Agency comments (in RLSO), the word version of the abbreviated Wet Weather SAP (in RLSO), and a compiled clean version of the Wet Weather SAP in .pdf. We intend on beginning the biological surveys later this week and continue as long as necessary to conclude whether sediment is present or not in the low lying areas planned for sediment sampling. We also plan on scheduling surface water sampling at Area 39. Please let me know if you would like to coordinate split sampling.

As stated previously, we will continue to work on responding to the remaining comments and, once approved, we will prepare a final BERA SAP, including the details in this wet weather sampling plan.

Thanks again for your expedited reviews. Please let me know if you have questions. Chris

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Subject: Aerojet Rocketdyne - BERA SAP - Wet Weather Sampling Discussion

Hi Everyone – Thanks again for participating in our call on February 23, 2021. Following the call, AR and its subcontractors (M. Weisberg, S. Kraemer, and B. Sample) discussed a variety of issues and would like to propose the following related to planned wet weather sediment sampling (and associated toxicity/bioavailability tests) at locations within Lines 1, 3, 4 and the Central Disposal Area (CDA) (currently shown on SAP Figures 2-8 and 2-9).

Our recommended alternative approach would be to conduct a few field surveys during the next several weeks to determine if current conditions are likely to be supportive of benthic invertebrate and/or amphibian populations at the proposed sediment locations. This step is needed because the historical “hotspot” COPEC locations identified in the 2016 draft SAP (shown in Figures 2-8 and 2-9) were based on non-wet weather collection events, where samples were collected proximate to suspected historical discharge areas (e.g., near outfalls, drains, etc. adjacent to buildings where washout/cleanout activities would have occurred during facility operations or in low-lying areas adjacent to known contamination [e.g., open burning at CDA, Fig. 2-9]). These samples (identified at the time as being ‘sediment’) were often collected from slicken areas (i.e., low-lying furrows with silt and clay between cobble dredge piles/rows associated with historical hydraulic gold dredging activities [from early 1900s to approximately 1960]). Even though these samples were labeled as sediment (SD) on field collection logs, this designation was not a true indication of actual sediment being present. The SD designation was based on suspected sediment being present during the wet weather season.

Now that actual sediment sampling and associated bioassay testing is imminent, a closer evaluation of these proposed locations is warranted. Given the highly seasonal precipitation and very ephemeral nature of most surface water at the site, it is possible that viable aquatic and/or amphibian habitat is not actually present in these areas. Field surveys (following rain events) are proposed, to evaluate actual conditions, including presence of standing water, water depth, plant and/or amphibian species present, and length of time standing water and/or wet sediments persists. Detailed photographs and field notes would be collected. In addition, areas downgradient of the proposed locations would also be evaluated, as some COPECs may have migrated to wetter areas, although with likely lower COPEC concentrations.

Rebel Hill Ditch (south and east of Lines 1,3, and 4) surface water sampling (and associated toxicity/bioavailability tests) is no longer planned due to the fact that the historical concentrations of the one final COPEC in surface water for this area (barium) had a maximum measured concentration of 38 ug/L (out of the two samples with detected results). This maximum concentration is now below the current chronic screening level of 220 ug/L (Table 1a in EPA Region 9-recommended *Region 4 ERA Supplemental Guidance*, March 2018).

Surface water sampling (and associated toxicity/bioavailability tests) are still planned for Area 39, as numerous metals and perchlorate were final COPECs at this area, and this area is expected to remain wet/flooded well into late spring. Due to the persistence of surface water at Area 39, AR intends on collecting samples for chemical analysis during the first event to determine if COPECs remain and, if COPECs do remain, revisiting the surface water bodies for collection of samples for chemical and toxicological analyses. Note: No final COPECs were identified for sediment at Area 39.

Let me know if you have questions. Thanks, Chris

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